

OVERVIEW OF THE 2019 CSA-LEAD CANMOON LUNAR SAMPLE RETURN ANALOGUE MISSION.

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Introduction: As part of its Lunar Exploration Analogue Deployment (LEAD), the Canadian Space Agency (CSA) is carrying out a series of field tests and analogue missions to test technologies, develop mission operations architectures, and provide training for students and young professionals. The CanMoon lunar sample return analogue mission is a joint endeavor of Western University and the University of Winnipeg. This analogue mission is designed to accurately simulate near real-time communication between a mission control station and a scientific rover platform on the lunar surface. The goal is to assess the decision-making abilities of the mission control team and document the approaches undertaken to complete remote scientific analysis. This analogue mission will assess the effectiveness of several approaches to operating a remote rover platform in near real-time conditions in preparation for future rover missions to the lunar surface.

Analogue Mission Overview: CanMoon analogue mission operations will be divided into four teams. A Field Team will be responsible for overseeing the analogue rover and instruments at the field site on the volcanic island of Lanzarote, Spain. A Planning Team will be responsible for directing rover actions from a mission control room located at Western University in London, Ontario. A Tactical Science Team, also located in mission control, will be responsible for making decisions about sample locations and individual instrument usage and targeting. Finally, a Science Interpretation Team will be responsible for analyzing the data obtained by the Planning and Science Processing teams to guide all teams toward meeting the overall scientific goals. The three in-simulation teams located at Western (Planning, Science Processing, and Science Interpretation) will have four overarching scientific goals to complete during the mission: 1. To characterize the local geology using data obtained by the rover, 2. To identify and sample any mantle xenoliths or material from the planet's interior brought to the surface through volcanic processes, 3. To identify the best sample from which to obtain an accurate age date, and 4. To identify and sample any volcanic material containing a high volatile content analogous to hydrogen-bearing minerals on the lunar surface which would be the target of future in-situ resource collection and processing. The rover platform used by the CanMoon teams during this mission will carry a suite of stand-off compositional instruments and

visible light cameras for documenting the geology and geomorphology of the analogue field site. The CanMoon mission will take place over two weeks in August 2019. During the first week, the in-simulation mission control teams will be composed of a single shift working ~10 hours each day. During the second week of operations the mission control team will be split into two shifts each covering ~5 hours of rover operations each day. This second week division of operations will allow the mission teams to simulate shift handovers that will be needed during future long-duration lunar surface rover missions. The results of this analogue mission will feed in to the proposed joint CSA, European Space Agency (ESA), and Japanese Aerospace Exploration Agency (JAXA) HERACLES mission to the lunar surface.